

Title : Outage-Less Database Change Operation

Inventors : Christopher Parker and Donald Black

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P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

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I. REAL PARTY IN INTEREST

BMC Software, Inc. is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

None.

III. STATUS OF CLAIMS

Claims 1-38 are rejected. Claims 1-38 are appealed.

IV. STATUS OF AMENDMENTS

None.

V. SUMMARY OF CLAIMED SUBJECT MATTER

This section provides a concise explanation of the subject matter defined in each independent claim involved in this appeal, referring to the specification by paragraph and line number and to the drawings by reference characters as required by 37 C.F.R. 41.37(c)(1)(v). *Note bene*, citation to passages in the specification and drawings for each claim element does not imply that the limitations from the specification and drawings should be read into the corresponding claim element.

Generally, Appellant claims a method, program storage device and system to change the structure of a database, or a portion thereof, without causing a user outage (300; ¶ 24, ℓ. 1-2). This result is achieved by creating shadow copies of a specified portion of a source database's information (*e.g.*, tables and indices), maintaining locks (as opposed to restrictive states) on those portions and then swapping the structurally changed shadow portions for their corresponding source database portions (310; ¶ 24, ℓ. 3-7). The use of shadow copies and locks in the manner described, permits database update operations that avoid the use of restricted states that, by definition, create user outages (300; ¶ 14, ℓ. 1-7; ¶ 17, ℓ. 1-11; ¶ 24, ℓ. 7-9).

Independent claim 1 recites a database update method comprising the acts of receiving a database change command to alter the structure of a target database (305; ¶ 15, ℓ. 1-3); determining one or more portions of the target database that will be affected by the change command (¶ 15, ℓ. 3-4; ¶ 19, ℓ. 4-8); creating one or more shadow portions of the determined one or more portions (310; ¶ 15, ℓ. 3-4; 400, 405, 410, 415, 420, 425, 500, 505, 510; ¶ 18-20; Table 1, Table 2); changing the one or more shadow portions in accordance with the change command (315; ¶ 15, ℓ. 4-11); executing the change command against the target database (315; ¶ 15, ℓ. 4-11; 320, 325; ¶ 16, ℓ. 1-4; ¶ 22; Table 3); and swapping the one or more shadow portions for the determined one or more portions (330; ¶ 16, ℓ. 4-9; 600, 605; ¶ 23; Table 4),

wherein the act of creating and changing occur before the act of executing (310-315; ¶ 24, ℓ. 3-9) and further wherein said database update method does not cause a user outage (Abstract; ¶ 1; ¶ 7, ℓ. 1-3; ¶ 14, ℓ. 1-4; ¶ 17, ℓ. 6-7; ¶ 24, ℓ. 1-2).

Independent claim 13 is directed to a program storage device, readable by a programmable control device, comprising instructions stored thereon for causing the programmable control device to perform the method of independent claim 1 (¶ 25, ℓ. 1-3). Independent claim 25 is directed to a database system for performing the method of independent claim 1.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-38 stand rejected under 35 U.S.C. 103(a) over U.S. Patent 6,070,170 to Friske et al. ("Friske") in view of U.S. Patent Application Publication 2003/0135478 to Marshall et al. ("Marshall").

VII. ARGUMENT

As independent claims 13 and 25 are directed to substantially the same subject matter as independent claim 1 (albeit in different contexts), Appellant's argument with respect to independent claim 1 applies with equal force to independent claims 13 and 25 and, therefore, to all claims under appeal. Accordingly, all claims stand or fall together. After a concise discussion of the Examiner's rejection and the cited art, Appellant's arguments are presented below under separate headings as required by 37 C.F.R. 41.37(c)(l)(vii).

A. Section 103 Rejections (35 U.S.C. 103)

Claims 1-38 were rejected over Friske in view of Marshall. Specifically, the Final Office Action at pages 2-3 alleges that:

As for claim 1 Frisk discloses: determining one or more portions of a target database that will be affected by the change command (See column 6 lines 5-9); creating one or more shadow portions of the determined one or more portions (See column 6 lines 25-27) swapping the one or more shadow portions for the determined one or more portions (See column 6 lines 42-44) wherein the act of creating and changing occur before the act of executing and further wherein said database update method does not cause a user outage (See column 6 lines 60-65).

Further, the Final Office Action at page 3 admits that:

While Frisk does not differ substantially from the claimed invention the disclosure of receiving a database change command, to alter the structure of a target database, changing the one or more shadow portions in accordance with the change command, executing the change command against the target database is not necessarily explicit.

The Final Office Action, at page 3, cites to Marshall (specifically ¶¶ 37, 38 and 43) to overcome this perceived weakness.

Appellant respectfully traverses this interpretation of Friske and the purported use of Marshall, submitting that Friske does not teach, describe or fairly suggest making *any structural changes* to a database. In like fashion, Marshall does not teach, describe or fairly suggest making structural changes to a database. As a consequence, neither Friske or Marshall (alone or in combination) teach all aspects of the claimed invention. For at least this reason, the Examiner has failed to make a legitimate section 103 rejection.

B. Friske (US 6,070,170)

Friske is directed to the "online reorganization of data contained in a database ... while allowing substantially uninterrupted access to the database." Friske at 1:26-30 (emphasis added).¹ As described by Friske, "[o]ne problem ... [in large databases] is the physical location of the leaf pages often becomes quite scattered ... [resulting] ... in reduced performance." Friske at 1:63-2:3. To overcome this scattering effect, the data within the database "need to be reorganized periodically so that the logical and physical ordering between leaf pages and data pages better correspond." Friske at 2:5-8. Friske describes one technique to reorganize data within a database without causing a significant user outage. Friske at 5:64-6:67.

C. Marshall (US Pat Pub 2003/0135478)

As noted by Marshall, "[w]hen a transaction is performed such that data is added, updated and/or deleted from the database, the data may become disorganized or fragmented. When this occurs, response time to database queries can be compromised ... Accordingly, performance of the database can be improved by reorganization ... However, conventional systems take the database offline for

¹ As used herein, the notation A:B-C means column A, lines B to C. Similarly, the notation A:B-C:D means column A, line B to column C, line D.

reorganization." Marshall at ¶ 8 (emphasis added). Similar to Friske, Marshall is directed to "a system and method that allows reorganization of databases such as IMS databases while allowing read and update activity to continue." Marshall at ¶ 33; see also Abstract and ¶ 3.

D. Comments on Friske and Marshall

As described above, both Friske and Marshall are directed solely to reorganizing data in a database. That is, neither reference teaches, describes or even suggests changing the underlying database's structure as explicitly recited in independent claims 1, 13 and 25. The Examiner contends, however, that "[t]he cited references also make structural changes to a database, for example Marshall at paragraph 0008 discloses that Reorganization may also reclaim previously unusable space in the database." Final Office Action at page 9 (internal quotations omitted). As shown below, however, the cited passage is clearly directed to aspects of "reorganization" which, as defined by Marshall, is directed to operations on data, not structure. Specifically, Marshall describes reclaiming space within an existing database that was previously unusable because of "disorganized or fragmented" data – Marshall does not even suggest such an operation makes structural changes to a database.

[0008] When a transaction is performed such that data is added, updated and/or deleted from the database, the data may become disorganized or fragmented. When this occurs, response time to database queries can be compromised. Accordingly, many systems provide a method of reorganizing the data so that the related data can be physically grouped together. This makes access to the data faster and more efficient. Accordingly, performance of the database can be improved by reorganization. Reorganization may also reclaim previously unusable space in the database. However, conventional systems take the database offline for reorganization.

Not only would the distinction between "data reorganization" and "structural change" be obvious to one of ordinary skill in the art, *Appellant explicitly distinguishes a database's "data" from its "structure."* Specification as filed at ¶ 2.

While the Final Office Action appears to recognize this argument, the Examiner rejects its logic by simply claiming that he is "entitled to give claim limitations their broadest reasonable interpretation in light of the specification" (page 8). Appellant does not disagree that the Examiner is permitted to do this. However, the Examiner's interpretation runs counter to **(1)** the clear and unambiguous teaching of the cited art, **(2)** the explicit language of the claims and **(3)** the express teaching of the specification. As such, the Examiner's interpretation is patently unreasonable.

With the distinction between content/data and structure clear, neither Friske or Marshall (alone or in combination) teach, describe or fairly suggest all elements of the claimed invention. For at least this reason, the Examiner has utterly failed to make a legitimate *prima facie* case of obviousness under section 103(a).

E. Conclusion

Appellant submits that neither Friske or Marshall (alone or in combination) teach, describe or fairly suggest all elements of the claimed invention. As a result, Appellant submits that all of the claims are allowable.

Respectfully submitted,

/Coe F. Miles, Ph.D., J.D./

Reg. No. 38,559

Wong, Cabello, Lutsch, Rutherford & Brucculeri, L.L.P.
Customer No. 29855 Voice: 832-446-2418
20333 SH 249, Suite 600 Mobile: 713-502-5382
Houston, Texas 77070 Facsimile: 832-446-2458
Email: cmiles@counselIP.com

VIII. CLAIMS APPENDIX

1. (Previously Presented): A database update method, comprising:
 - receiving a database change command to alter the structure of a target database;
 - determining one or more portions of the target database that will be affected by the change command;
 - creating one or more shadow portions of the determined one or more portions;
 - changing the one or more shadow portions in accordance with the change command;
 - executing the change command against the target database; and
 - swapping the one or more shadow portions for the determined one or more portions,

wherein the act of creating and changing occur before the act of executing and further wherein said database update method does not cause a user outage.
2. (Original): The method of claim 1, wherein the target database comprises a DB2 partitioned database.
3. (Original): The method of claim 2, wherein the database change command comprises an ALTER command.

4. (Original): The method of claim 2, wherein the determined one or more portions comprise one or more partitions.

5. (Previously Presented): The method of claim 1, wherein the act of creating comprises unloading the determined one or more portions into work files.

6. (Original): The method of claim 5, wherein the act of updating comprises updating the work files in accordance with the change command into one or more shadow portions.

7. (Previously Presented): The method of claim 1, wherein the act of updating further comprises updating the one or more shadow portions to incorporate data content changes in the target database occurring since said act of receiving and before said act of executing.

8. (Previously Presented): The method of claim 7, wherein target database log files are used to drive said act of updating the one or more shadow portions to incorporate data content changes in the target database occurring since said act of receiving and before said act of executing.

9. (Original): The method of claim 1, further comprising establishing a lock on the target database after said act of executing and before said act of swapping.

10. (Original): The method of claim 9, further comprising removing a restricted state status from at least one of the determined one or more portions resulting from the act of executing, said act of removing occurring before the act of swapping.
11. (Original): The method of claim 10, wherein the act of removing is performed after the act of establishing.
12. (Original): The method of claim 1 further comprising committing the change command, said act of committing to be performed before the act of swapping.
13. (Previously Presented): A program storage device, readable by a programmable control device, comprising instructions stored on the program storage device for causing the programmable control device to:
 - receive a database change command to alter the structure of a target database;
 - determine one or more portions of the target database that will be affected by the change command;
 - create one or more shadow portions of the determined one or more portions;
 - change the one or more shadow portions in accordance with the change command;
 - execute the change command against the target database; and
 - swap the one or more shadow portions for the determined one or more portions,

wherein the instructions to create and change are performed before the instructions to execute and further wherein said instructions to receive, determine, create, change, execute and swap do not cause a user outage.

14. (Original): The program storage device of claim 13, wherein the target database comprises a DB2 partitioned database.

15. (Original): The program storage device of claim 14, wherein the database change command comprises an ALTER command.

16. (Original): The program storage device of claim 14, wherein the instructions to determine one or more portions comprise instructions to determine one or more partitions.

17. (Previously Presented): The program storage device of claim 13, wherein the instructions to create comprise instructions to unload the determined one or more portions into work files.

18. (Original): The program storage device of claim 17, wherein the instructions to change comprise instructions to change the work files in accordance with the change command into one or more shadow portions.

19. (Previously Presented): The program storage device of claim 13, wherein the instructions to update further comprise instructions to update the one or more shadow portions to incorporate data content changes in the target database occurring since performing the instructions to receive and before performing the instructions execute.

20. (Previously Presented): The program storage device of claim 19, wherein target database log files are used to drive said instructions to update the one or more shadow portions to incorporate data content changes in the target database occurring since performing the instructions to receive and before performing the instructions execute.

21. (Original): The program storage device of claim 13, further comprising instructions to establish a lock on the target database after performing said instructions to execute and before performing said instructions to swap.

22. (Original): The program storage device of claim 21, further comprising instructions to remove a restricted state status from at least one of the determined one or more portions resulting from performing the instructions to execute, said instructions to remove being performed before said instructions to swap.

23. (Original): The program storage device of claim 22, wherein the instructions to remove are performed after the instructions to establish.

24. (Original): The program storage device of claim 13 further comprising instructions to commit the change command, said instructions to commit to be performed before the instructions to swap.
25. (Previously Presented): A database system, comprising:
a storage device having stored thereon a database, said database having a plurality of partitions; and
a computer unit operatively coupled to the storage device, the computer unit including a processor and a memory, the memory having stored thereon instructions for causing the processor to:
receive a database change command directed to changing the structure of the database,
determine one or more partitions of the database that will be affected by the change command,
create one or more shadow partitions of the determined one or more partitions,
change the one or more shadow partitions in accordance with the change command,
execute the change command against the database,
swap the one or more shadow partitions for the determined one or more partitions,

wherein the instructions to create and change are performed before the instructions to execute and further wherein said instructions to receive, determine, create, change, execute and swap do not cause a user outage to the database.

26. (Original): The database system of claim 25, wherein the database comprises a DB2 database.

27. (Original): The database system of claim 26, wherein the database change command comprises an ALTER command.

28. (Original): The database system of claim 25, wherein the instructions to create comprise instructions to:

unload the determined one or more partitions into one or more work files; and
change the work files in accordance with the change command into the one or more shadow partitions.

29. (Previously Presented): The database system of claim 25, wherein the instructions to update further comprise instructions to update the one or more shadow partitions to incorporate data content changes in the database occurring since performing the instructions to receive and before performing the instructions execute.

30. (Previously Presented): The database system of claim 29, wherein database log files are used to drive said instructions to update the one or more shadow partitions to incorporate data content changes in the database occurring since performing the instructions to receive and before performing the instructions execute.

31. (Original): The database system of claim 25, wherein the instructions further comprise instructions to establish a lock on the database after performing said instructions to execute and before performing said instructions to swap.

32. (Original): The database system of claim 31, wherein the instructions further comprise instructions to remove a restricted state status from at least one of the determined one or more partitions resulting from performing the instructions to execute, said instructions to remove being performed before said instructions to swap.

33. (Original): The database system of claim 32, wherein the instructions to remove are performed after the instructions to establish.

34. (Original): The database system of claim 25, wherein the instructions further comprise instructions to commit the change command, said instructions to commit to be performed before the instructions to swap.

35. (Previously Presented): The database system of claim 25, wherein the storage device comprises one or more direct access storage devices.

36. (Original): The database system of claim 35, wherein the one or more direct access storage devices are operatively coupled to the computer unit by a computer network.

37. (Original): The database system of claim 36, wherein the computer network comprises the Internet.

38. (Original): The database system of claim 36, wherein the computer network comprises an intranet.

IX. EVIDENCE APPENDIX

1. US Patent 6,070,170 to Friske et al.
2. US Patent Publication 2003/0135378 to Marshall et al.

X. RELATED PROCEEDINGS APPENDIX

None.